

WHAT IS CLAIMED IS:

1. A state-of-charge detector device that detects a state of charge of a secondary battery, comprising:

5 a current detector that detects an electric current through the secondary battery;

 a voltage detector that detects a voltage between terminals of the secondary battery;

10 an internal resistance calculator that calculates an internal resistance of the secondary battery based on the current detected and the voltage detected;

 an internal resistance changing rate calculator that calculates a rate of change in the internal resistance calculated, with respect to an amount of charge stored in the secondary battery; and

15 a state-of-charge determinator that determines a state of charge of the secondary battery based on the rate of change in the internal resistance calculated.

2. The state-of-charge detector device according to claim 1, wherein the state-of-charge determinator determines that the secondary battery is fully charged, if the internal resistance has decreased by at least a predetermined value following a positive-to-negative shift of the rate of change in the internal resistance.

25 3. The state-of-charge detector device according to claim 2, wherein the internal resistance changing rate calculator calculates the rate of change in the internal resistance with respect to the amount of charge that is an accumulated amount of the current detected by the current detector.

4. The state-of-charge detector device according to claim 3, further comprising a temperature detector that detects a temperature of the secondary battery,

30 wherein the state-of-charge determinator determines the state of charge based on the temperature of the secondary battery detected by the temperature detector and the rate of change in the internal resistance calculated by the internal resistance changing rate calculator.

5. The state-of-charge detector device according to claim 2, wherein the internal resistance changing rate calculator calculates the rate of change in the internal resistance with respect to the amount of charge that is an accumulated amount of electric power calculated from the current detected by the current detector and the voltage detected by the voltage detector.

6. The state-of-charge detector device according to claim 5, further comprising a temperature detector that detects a temperature of the secondary battery,

10 wherein the state-of-charge determinator determines the state of charge based on the temperature of the secondary battery detected by the temperature detector and the rate of change in the internal resistance calculated by the internal resistance changing rate calculator.

7. The state-of-charge detector device according to claim 2, further comprising a 15 temperature detector that detects a temperature of the secondary battery,

16 wherein the state-of-charge determinator determines the state of charge based on the temperature of the secondary battery detected by the temperature detector and the rate of change in the internal resistance calculated by the internal resistance changing rate calculator.

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8. The state-of-charge detector device according to claim 1, wherein the internal resistance changing rate calculator calculates the rate of change in the internal resistance with respect to the amount of charge that is an accumulated amount of the current detected by the current detector.

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9. The state-of-charge detector device according to claim 8, further comprising a temperature detector that detects a temperature of the secondary battery,

30 wherein the state-of-charge determinator determines the state of charge based on the temperature of the secondary battery detected by the temperature detector and the rate of change in the internal resistance calculated by the internal resistance changing rate calculator.

10. The state-of-charge detector device according to claim 1, wherein the internal resistance changing rate calculator calculates the rate of change in the internal

resistance with respect to the amount of charge that is an accumulated amount of electric power calculated from the current detected by the current detector and the voltage detected by the voltage detector.

5 11. The state-of-charge detector device according to claim 10, further comprising a temperature detector that detects a temperature of the secondary battery,
wherein the state-of-charge determinator determines the state of charge based on the temperature of the secondary battery detected by the temperature detector and the rate of change in the internal resistance calculated by the internal resistance
10 changing rate calculator.

12. The state-of-charge detector device according to claim 1, further comprising a temperature detector that detects a temperature of the secondary battery,
wherein the state-of-charge determinator determines the state of charge based on the temperature of the secondary battery detected by the temperature detector and the rate of change in the internal resistance calculated by the internal resistance
15 changing rate calculator.

20 13. A program that causes a computer connected to a current detector that detects an electric current through a secondary battery and to a voltage detector that detects a voltage between terminals of the secondary battery, to function as a state-of-charge detector device that detects a state of charge of the secondary battery, the program comprising:
calculating an internal resistance of the secondary battery based on the current
25 detected by the current detector and the voltage detected by the voltage detector;
calculating a rate of change in the internal resistance calculated, with respect to an amount of charge stored in the secondary battery; and
determining a state of charge of the secondary battery based on the rate of change in the internal resistance calculated.

30 14. A state-of-charge detecting method for detecting a state of charge of a secondary battery, comprising:
detecting an electric current through the secondary battery;
detecting a voltage between terminals of the secondary battery;

calculating an internal resistance of the secondary battery based on the current detected and the voltage detected;

calculating a rate of change in the internal resistance calculated, with respect to an amount of charge stored in the secondary battery; and

5 determining a state of charge of the secondary battery based on the rate of change in the internal resistance calculated.

15. A charge-discharge control device that controls charging and discharging of a secondary battery, comprising:

10 a state-of-charge detector device as described in claim 1 which detects a state of charge of the secondary battery; and

a charge-discharge controller that controls the charging and discharging of the secondary battery based on the state of charge detected.

15 16. A charge-discharge control device that controls charging and discharging of a secondary battery, comprising:

a state-of-charge detector device as described in claim 12 which detects a state of charge of the secondary battery; and

20 a charge-discharge controller that controls the charging and discharging of the secondary battery based on the state of charge detected.